UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/796,733	03/09/2004	Dimitre Hristov Hristov	2003P17999US	1750

7590 04/04/2007

Siemens Corporation
Attn: Elsa Keller, Legal Administrator
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER	
TABATABAI, ABOLFAZL	
ART UNIT	PAPER NUMBER
2624	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/04/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/796,733	HRISTOV, DIMITRE HRISTOV	
	Examiner	Art Unit	
	Abolfazl Tabatabai	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 5-10, 14, 15, 17, 18, 22-24, 26-31, 35, 36, 38 and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Yavuz et al (U. S. 6,522,712 B1).

Regarding claim 1, Yavuz discloses a method comprising:

acquiring a plurality of images of a first portion of a body undergoing substantially periodic motion (please note, to column 12, lines 46-49), each of the plurality of images associated with a respective time [according to Fig. 1, an x-ray imaging system 100 with the capability to generate tomographic images of an object in motion. Such an imaging system may comprise a system or apparatus for acquiring timing data by which the projection data collected by the system may be correlated in time with the motion of the imaged object. The system 100 may be used to generate tomographic images of a patient's heart which Examiner considers that as images of a first portion of a body (please note, to column 7, lines 45-55)];

determining a correlation between at least two of the plurality of images [according to Fig.25, an operation 2510 cross-references the view angles of the helical projection data and the timing of the cardiac cycle. This may entail tagging the set of projection data for each view angle with timing information. The operation 2510 thereby

correlates the projection data sets to the cardiac cycle phases to which the respective data sets correspond (please note, to column 25, lines 28-36)]; and,

determining a period of the periodic motion based on the respective times associated with the at least two of the plurality of images [Figs. 8-9, illustrate analysis of sinogram data through a different perspective. The diagonal trajectories 1, 2, and 3 in Fig. 8, illustrate the time dependence of the sonogram data. Thus, each trajectory (1, 2, or 3) represents a sequence of sinogram rows θ evolves in time. However, like the sinograms they represent these trajectories actually represent the sinogram data as comprising projection views corresponding to a discrete sequence of a view angles θ. If the period of cardiac cycle and the period of data acquisition cycle are different, projection views can be collected corresponding to different phases of the heart during each rotation. Here T_{gantry} and T_{heart} correspond to scanning rotation period and cardiac cycle period, respectively (please note, to column 13, lines 25-35)].

Regarding claim 2, Yavuz discloses a method according to claim 1, wherein the plurality of images comprises three-dimensional cross-sectional images of the first portion of the body (please note, to column 12, lines 1-3).

Regarding claim 3, Yavuz discloses a method according to claim 2, wherein the images are acquired by a computed tomography scanner (please note, to column 13, lines 25-35).

Regarding claim 5, Yavuz discloses a method according to claim 1, wherein the plurality of images comprises projection images of the first portion of the body (please note, to column 12, lines 6-9).

Regarding claim 6, Yavuz discloses a method according to claim 5, wherein acquiring the plurality of images comprises:

acquiring the plurality of images at a first projection angle with respect to the body [according to Fig. 26, element 2610 which determines helical projection data at selected view angle and close timing prior to selected phase timing corresponds to first projection angle (please note, to column 26, lines 17-24)].

Regarding claim 7, Yavuz discloses a method according to claim 6, further comprising:

acquiring a projection image of the portion of the body at a second projection angle with respect to the body, the projection image acquired at a time substantially equal to a time associated with one of the at least two of the plurality of images plus an integer multiple of the determined period [according to Fig. 26, element 2620 which determines helical projection data at selected view angle and close timing after selected phase timing corresponds to second projection angle (please note, to column 26, lines 17-24)].

Regarding claim 8, Yavuz discloses a method according to claim 7, further comprising:

generating a combined projection image based on the at least two of the plurality of images (please note, to column 5, lines 64-67); and generating a second combined image based on the combined image and the projection image acquired at a second projection angle with respect to the body (please note, to column 14, lines 41-49).

Regarding claim 9, Yavuz discloses a method according to claim 7, further comprising:

acquiring a second plurality of images of the portion of the body at a second projection angle with respect to the body, each of the second plurality of images associated with a respective time (please note, to column 7, lines 45-55); determining a correlation between at least two of the second plurality of images (please note, to column 7, lines 45-55); and determining the period of the periodic motion based on the respective times associated with the at least two of the second plurality of images [Figs. 8-9, illustrate analysis of sinogram data through a different perspective. The diagonal trajectories 1, 2, and 3 in Fig. 8 illustrate the time dependence of the sonogram data. Thus, each trajectory (1, 2, or 3) represents a sequence of sinogram rows θ evolves in time. However, like the sinograms they represent these trajectories actually represent the sinogram data as comprising projection views corresponding to a discrete sequence of a view angles θ. If the period of cardiac cycle and the period of data acquisition cycle are different, projection views can be collected corresponding to different phases of the heart during each rotation. Here T_{gantry} and T_{heart} correspond to scanning rotation period and cardiac cycle period, respectively (please note, to column 13, lines 25-35)].

Regarding claim 10, Yavuz discloses a method according to claim 5, further comprising:

generating a combined image corresponding to a first phase of the periodic motion based on the at least two of the plurality of images (please note, to column 5, lines 64-67).

Regarding claim 14, Yavuz discloses a method according to claim 1, wherein determining the correlation comprises:

determining that the at least two of the plurality of images represent substantially a same phase of the periodic motion (please note, to column 36, lines 23-25).

Regarding claim 15, Yavuz discloses a method according to claim 1, further comprising:

generating a combined image corresponding to a first phase of the periodic motion based on the at least two of the plurality of images (please note, to column 5, lines 64-67).

Regarding claim 17, Yavuz discloses a method according to claim 1, further comprising:

acquiring an image of a second portion of the body at a time substantially equal to a time associated with one of the at least two of the plurality of images plus an integer multiple of the determined period [according to Fig. 26, element 2620 which determines helical projection data at selected view angle and close timing after selected phase timing corresponds to second projection angle (please note, to column 26, lines 17-24)].

Regarding claim 18, Yavuz discloses a method according to claim 17, further comprising:

generating a combined image based on the at least two of the plurality of images (please note, to column 5, lines 64-67); and,

generating a second combined image based on the combined image and the image of the second portion of the body (please note, to column 14, lines 41-49).

Regarding claim 22, Yavuz discloses an apparatus comprising:

a memory storing processor-executable process steps (please note, to Fig. 1 element 144); and,

a processor (please note, to Fig. 1 element 132) in communication with the memory (please note, to Fig. 1 element 134) and operative in conjunction with the stored process steps to:

acquire a plurality of images of a first portion of a body undergoing substantially periodic motion (please note, to column 12, lines 46-49), each of the plurality of images associated with a respective time [according to Fig. 1, an x-ray imaging system 100 with the capability to generate tomographic images of an object in motion. Such an imaging system may comprise a system or apparatus for acquiring timing data by which the projection data collected by the system may be correlated in time with the motion of the imaged object. The system 100 may be used to generate tomographic images of a patient's heart which Examiner considers that as images of a first portion of a body (please note, to column 7, lines 45-55)];

determine a correlation between at least two of the plurality of images [according to Fig. 25, an operation 2510 cross-references the view angles of the helical projection data and the timing of the cardiac cycle. This may entail tagging the set of projection data for each view angle with timing information. The operation 2510 thereby correlates

the projection data sets to the cardiac cycle phases to which the respective data sets correspond (please note, to column 25, lines 28-36)]; and,

determine a period of the periodic motion (please note, to column 12, lines 46-49) based on the respective times associated with the at least two of the plurality of images [Figs. 8-9, illustrate analysis of sinogram data through a different perspective. The diagonal trajectories 1, 2, and 3 in Fig. 8 illustrate the time dependence of the sonogram data. Thus, each trajectory (1, 2, or 3) represents a sequence of sinogram rows θ evolves in time. However, like the sinograms they represent these trajectories actually represent the sinogram data as comprising projection views corresponding to a discrete sequence of a view angles θ. If the period of cardiac cycle and the period of data acquisition cycle are different, projection views can be collected corresponding to different phases of the heart during each rotation. Here T_{gantry} and T_{heart} correspond to scanning rotation period and cardiac cycle period, respectively (please note, to column 13, lines 25-35)].

Regarding claim 23, Yavuz discloses an apparatus according to claim 22, wherein the plurality of images comprise three-dimensional cross-sectional images of the first portion of the body (please note, to column 12, lines 1-3).

Regarding claim 24, Yavuz discloses an apparatus according to claim 23, wherein the images are acquired by a computed tomography scanner (please note, to column 13, lines 25-35).

Regarding claim 26, Yavuz discloses an apparatus according to claim 22, wherein the plurality of images comprise projection images of the first portion of the body (please note, to column 12, lines 6-9).

Regarding claim 27, Yavuz discloses an apparatus according to claim 26, wherein acquisition of the plurality of images comprises:

acquisition of the plurality of images at a first projection angle with respect to the body [according to Fig. 26, element 2610 which determines helical projection data at selected view angle and close timing prior to selected phase timing corresponds to first projection angle (please note, to column 26, lines 17-24)].

Regarding claim 28, Yavuz discloses an apparatus according to claim 27, the processor further operative in conjunction with the stored process steps to: acquire a projection image of the portion of the body at a second projection angle with respect to the body, the projection image acquired at a time substantially equal to a time associated with one of the at least two of the plurality of images plus an integer multiple of the determined period [according to Fig. 26, element 2620 which determines helical projection data at selected view angle and close timing after selected phase timing corresponds to second projection angle (please note, to column 26, lines 17-24)].

Regarding claim 29, Yavuz discloses an apparatus according to claim 28, the processor further operative in conjunction with the stored process steps to:

generate a combined projection image based on the at least two of the plurality of images (please note, to column 5, lines 64-67); and,

generate a second combined image based on the combined image and the projection image acquired at a second projection angle with respect to the body (please note, to column 14, lines 41-49).

Regarding claim 30, Yavuz discloses an apparatus according to claim 28, the processor further operative in conjunction with the stored process steps to:

acquire a second plurality of images of the portion of the body at a second projection angle with respect to the body, each of the second plurality of images associated with a respective time (please note, to column 7, lines 45-55); determine a correlation between at least two of the second plurality of images (please note, to column 7, lines 45-55); and determine the period of the periodic motion based on the respective times associated with the at least two of the second plurality of images [Figs. 8-9, illustrate analysis of sinogram data through a different perspective. The diagonal trajectories 1, 2, and 3 in Fig. 8 illustrate the time dependence of the sonogram data. Thus, each trajectory (1, 2, or 3) represents a sequence of sinogram rows θ evolves in time. However, like the sinograms they represent these trajectories actually represent the sinogram data as comprising projection views corresponding to a discrete sequence of a view angles θ. If the period of cardiac cycle and the period of data acquisition cycle are different, projection views can be collected corresponding to different phases of the heart during each rotation. Here T_{gantry} and T_{heart} correspond to scanning rotation period and cardiac cycle period, respectively (please note, to column 13, lines 25-35)].

Regarding claim 31, Yavuz discloses an apparatus according to claim 26, the processor further operative in conjunction with the stored process steps to: generate a

combined image corresponding to a first phase of the periodic motion based on the at least two of the plurality of images (please note, to column 5, lines 64-67).

Regarding claim 35, Yavuz discloses an apparatus according to claim 22, wherein determination of the correlation comprises: determination that the at least two of the plurality of images represent substantially a same phase of the periodic motion (please note, to column 36, lines 23-25).

Regarding claim 36, Yavuz discloses an apparatus according to claim 22, the processor further operative in conjunction with the stored process steps to: generate a combined image corresponding to a first phase of the periodic motion based on the at least two of the plurality of images (please note, to column 5, lines 64-67).

Regarding claim 38, Yavuz discloses an apparatus according to claim 22, the processor further operative in conjunction with the stored process steps to: acquire an image of a second portion of the body at a time substantially equal to a time associated with one of the at least two of the plurality of images plus an integer multiple of the determined period [according to Fig. 26, element 2620 which determines helical projection data at selected view angle and close timing after selected phase timing corresponds to second projection angle (please note, to column 26, lines 17-24)].

Regarding claim 39, Yavuz discloses an apparatus according to claim 38, the processor further operative in conjunction with the stored process steps to: generate a combined image based on the at least two of the plurality of images (please note, to column 5, lines 64-67); and generate a second combined image based on the combined image and the image of the second portion of the body (please note, to column 14, lines

41-49).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4, 12, 13, 25, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yavuz et al (U. S. 6,522,712 B1) in view of Jaffray et al (U. S. 6,842,502 B2).

Regarding claim 4, Yavuz is silent about the specific details regarding a method according to claim 2, wherein the images are acquired using a linear accelerator.
In the same field (computed tomography imaging) of endeavor, Jaffray discloses cone beam computed tomography with a flat panel imager comprises the images are acquired using a linear accelerator (please note, to Fig. 17(a), element 409 and column 18, lines 61-65).
It would have been obvious to a person of ordinary skill in the art at the time to use a linear accelerator as taught by Jaffray in the system of Yavuz because Jaffray provides Yavuz an improved medical imaging system with a significant shift in the practice of radiation therapy. Not only does the high precision, image-guided system for radiation therapy address the immediate need to improve the probability of cure through close escalation, but it also provides opportunity for broad innovation in clinical practice (please note, to column 5, lines 18-23).

Regarding claim 12, Yavuz is silent about the specific details regarding a method according to claim 5, wherein the projection images are acquired by a C-arm.

In the same field (computed tomography imaging) of endeavor, Jaffray discloses cone beam computed tomography with a flat panel imager comprises the projection images are acquired by a C-arm (please note, to Fig. 21(a), element 610).

It would have been obvious to a person of ordinary skill in the art at the time to use the projection images are acquired by a C-arm as taught by Jaffray in the system of Yavuz because Jaffray provides Yavuz an improved medical imaging system with a significant shift in the practice of radiation therapy. Not only does the high precision, image-guided system for radiation therapy address the immediate need to improve the probability of cure through close escalation, but it also provides opportunity for broad innovation in clinical practice (please note, to column 5, lines 18-23).

Regarding claim 13, Yavuz is silent about the specific details regarding a method according to claim 5, wherein the projection images are acquired using a linear accelerator.

In the same field (computed tomography imaging) of endeavor, Jaffray discloses cone beam computed tomography with a flat panel imager comprises the images are acquired using a linear accelerator (please note, to Fig. 17(a), element 409 and column 18, lines 61-65).

It would have been obvious to a person of ordinary skill in the art at the time to use a linear accelerator as taught by Jaffray in the system of Yavuz because Jaffray provides Yavuz an improved medical imaging system with a significant shift in the practice of

radiation therapy. Not only does the high precision, image-guided system for radiation therapy address the immediate need to improve the probability of cure through close escalation, but it also provides opportunity for broad innovation in clinical practice (please note, to column 5, lines 18-23).

Regarding claim 25, Yavuz is silent about the specific details regarding an apparatus according to claim 23, wherein the images are acquired using a linear accelerator.

In the same field (computed tomography imaging) of endeavor, Jaffray discloses cone beam computed tomography with a flat panel imager comprises the images are acquired using a linear accelerator (please note, to Fig. 17(a), element 409 and column 18, lines 61-65).

It would have been obvious to a person of ordinary skill in the art at the time to use a linear accelerator as taught by Jaffray in the system of Yavuz because Jaffray provides Yavuz an improved medical imaging system with a significant shift in the practice of radiation therapy. Not only does the high precision, image-guided system for radiation therapy address the immediate need to improve the probability of cure through close escalation, but it also provides opportunity for broad innovation in clinical practice (please note, to column 5, lines 18-23).

Regarding claim 33, Yavuz is silent about the specific details regarding an apparatus according to claim 26, wherein the projection images are acquired by a C-arm.

In the same field (computed tomography imaging) of endeavor, Jaffray discloses

cone beam computed tomography with a flat panel imager comprises the projection images are acquired by a C-arm (please note, to Fig. 21(a), element 610).

It would have been obvious to a person of ordinary skill in the art at the time to use the projection images are acquired by a C-arm as taught by Jaffray in the system of Yavuz because Jaffray provides Yavuz an improved medical imaging system with a significant shift in the practice of radiation therapy. Not only does the high precision, image-guided system for radiation therapy address the immediate need to improve the probability of cure through close escalation, but it also provides opportunity for broad innovation in clinical practice (please note, to column 5, lines 18-23).

Regarding claim 34, Yavuz is silent about the specific details regarding an apparatus according to claim 26, wherein the projection images are acquired using a linear accelerator.

In the same field (computed tomography imaging) of endeavor, Jaffray discloses cone beam computed tomography with a flat panel imager comprises the images are acquired using a linear accelerator (please note, to Fig. 17(a), element 409 and column 18, lines 61-65).

It would have been obvious to a person of ordinary skill in the art at the time to use a linear accelerator as taught by Jaffray in the system of Yavuz because Jaffray provides Yavuz an improved medical imaging system with a significant shift in the practice of radiation therapy. Not only does the high precision, image-guided system for radiation therapy address the immediate need to improve the probability of cure through close

escalation, but it also provides opportunity for broad innovation in clinical practice (please note, to column 5, lines 18-23).

5. Claims 11, 16, 32 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yavuz et al (U. S. 6,522,712 B1) in view of Ikeda et al (U. S. 7,054,406 B2).

Regarding claim 11, Yavuz is silent about the specific details regarding a method according to claim 10, wherein acquiring the plurality of images comprises: setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging; and acquiring the least two of the plurality of images based on the x-ray tube current.

In the same field (computed tomography imaging) of endeavor, Ikeda discloses x-ray computed tomography apparatus and method of measuring CT values comprises setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging (please note to column 9, lines 18-26); and acquiring the least two of the plurality of images based on the x-ray tube current (please note, column9, lines 4-10).

It would have been obvious to a person of ordinary skill in the art at the time to use setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging as taught by Ikeda in the system of Yavuz because Ikeda provides Yavuz an improved x-ray computed tomography imaging apparatus and CT value measuring method which is capable of collecting necessary information and minimizing x-ray dose. The tube current and inter-scan interval is important parameters in reducing

the x-ray dose. Also this apparatus offers useful information for the timing determination to the operator (please note, to column 9, lines 15-17 and column 16, lines 13-14).

Regarding claim 16, Yavuz is silent about the specific details regarding a method according to claim 15, wherein acquiring the plurality of images comprises: setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging; and acquiring the least two of the plurality of images based on the x-ray tube current.

In the same field (computed tomography imaging) of endeavor, Ikeda discloses x-ray computed tomography apparatus and method of measuring CT values comprises setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging (please note to column 9, lines 18-26); and acquiring the least two of the plurality of images based on the x-ray tube current (please note, column9, lines 4-10).

It would have been obvious to a person of ordinary skill in the art at the time to use setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging as taught by Ikeda in the system of Yavuz because Ikeda provides Yavuz an improved x-ray computed tomography imaging apparatus and CT value measuring method which is capable of collecting necessary information and minimizing x-ray dose. The tube current and inter-scan interval is important parameters in reducing the x-ray dose. Also this apparatus offers useful information for the timing determination to the operator (please note, to column 9, lines 15-17 and column 16, lines 13-14).

Regarding claim 32, Yavuz is silent about the specific details regarding an apparatus according to claim 31, wherein acquisition of the plurality of images comprises: setting of an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging; and acquisition of the least two of the plurality of images based on the x-ray tube current.

In the same field (computed tomography imaging) of endeavor, Ikeda discloses x-ray computed tomography apparatus and method of measuring CT values comprises setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging (please note to column 9, lines 18-26); and acquiring the least two of the plurality of images based on the x-ray tube current (please note, column9, lines 4-10).

It would have been obvious to a person of ordinary skill in the art at the time to use setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging as taught by Ikeda in the system of Yavuz because Ikeda provides Yavuz an improved x-ray computed tomography imaging apparatus and CT value measuring method which is capable of collecting necessary information and minimizing x-ray dose. The tube current and inter-scan interval is important parameters in reducing the x-ray dose. Also this apparatus offers useful information for the timing determination to the operator (please note, to column 9, lines 15-17 and column 16, lines 13-14).

Regarding claim 37, Yavuz is silent about the specific details regarding an apparatus according to claim 36, wherein acquisition of the plurality of images comprises: setting of an x-ray tube current to less than or equal to half of a standard x-

ray tube current used for imaging; and acquisition of the least two of the plurality of images based on the x-ray tube current.

In the same field (computed tomography imaging) of endeavor, Ikeda discloses x-ray computed tomography apparatus and method of measuring CT values comprises setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging (please note to column 9, lines 18-26); and acquiring the least two of the plurality of images based on the x-ray tube current (please note, column9, lines 4-10).

It would have been obvious to a person of ordinary skill in the art at the time to use setting an x-ray tube current to less than or equal to half of a standard x-ray tube current used for imaging as taught by Ikeda in the system of Yavuz because Ikeda provides Yavuz an improved x-ray computed tomography imaging apparatus and CT value measuring method which is capable of collecting necessary information and minimizing x-ray dose. The tube current and inter-scan interval is important parameters in reducing the x-ray dose. Also this apparatus offers useful information for the timing determination to the operator (please note, to column 9, lines 15-17 and column 16, lines 13-14).

6. Claims 19-21 and 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yavuz et al (U. S. 6,522,712 B1) in view of O'Donnell et al (U. S. 6,563,941 B1).

Regarding claim 19, Yavuz is silent about the specific details regarding a method according to claim 1, further comprising:

acquiring a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time; determining a correlation between at least two of the second plurality of images; and determining the period of the periodic motion based on the respective times associated with the at least two of the second plurality of images.

In the same field (medical imaging) of endeavor, O'Donnell discloses model-based registration of cardiac CTA and MR acquisitions comprising:

acquiring a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time (please note, to column 6, lines 33-44); determining a correlation between at least two of the second plurality of images (please note, to column 5, lines 20-23); and determining the period of the periodic motion based on the respective times associated with the at least two of the second plurality of images (please note, to column 6, lines 33-44).

It would have been obvious to a person of ordinary skill in the art at the time to use a second plurality of images of a second portion of the body as taught by O'Donnell in the system of Yavuz because O'Donnell provides Yavuz an improved system with capability of combining MR and CT information for an improved image having both shape and function information about organic structures and tissues.

Regarding claim 20, Yavuz is silent about the specific details regarding a method according to claim 1, further comprising:

acquiring a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time substantially equal to a

time associated with one of the plurality of images of the first portion of a body plus an integer multiple of the determined period.

In the same field (medical imaging) of endeavor, O'Donnell discloses model-based registration of cardiac CTA and MR acquisitions comprising:

acquiring a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time substantially equal to a time associated with one of the plurality of images of the first portion of a body plus an integer multiple of the determined period (please note, to column 6, lines 33-44).

It would have been obvious to a person of ordinary skill in the art at the time to use a second plurality of images of a second portion of the body as taught by O'Donnell in the system of Yavuz because O'Donnell provides Yavuz an improved system with capability of combining MR and CT information for an improved image having both shape and function information about organic structures and tissues.

Regarding claim 21, Yavuz is silent about the specific details regarding a method according to claim 20, further comprising:

generating a combined image based on the at least two of the plurality of images; generating a second combined image based on at least two of the second plurality of images, each of the at least two of the second plurality of images associated with a time substantially equal to a time associated with one of the at least two of the plurality of images of the first portion of a body plus an integer multiple of the determined period; and generating a third combined image based on the combined image and the second combined image.

In the same field (medical imaging) of endeavor, O'Donnell discloses model-based registration of cardiac CTA and MR acquisitions comprising:

generating a combined image based on the at least two of the plurality of images (please note, to column 4, lines 17-24); generating a second combined image based on at least two of the second plurality of images, each of the at least two of the second plurality of images associated with a time substantially equal to a time associated with one of the at least two of the plurality of images of the first portion of a body plus an integer multiple of the determined period (please note, to column 6, lines 33-44); and generating a third combined image based on the combined image and the second combined image (please note, to Fig. 7, and column 8, lines 35-51).

It would have been obvious to a person of ordinary skill in the art at the time to use combined images as taught by O'Donnell in the system of Yavuz because O'Donnell provides Yavuz an improved system with capability of combining MR and CT information for an improved image having both shape and function information about organic structures and tissues.

Regarding claim 40, Yavuz is silent about the specific details regarding an apparatus according to claim 22, the processor further operative in conjunction with the stored process steps to:

acquire a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time; determine a correlation between at least two of the second plurality of images; and determine the period of the

periodic motion based on the respective times associated with the at least two of the second plurality of images.

In the same field (medical imaging) of endeavor, O'Donnell discloses model-based registration of cardiac CTA and MR acquisitions comprising:

acquire a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time (please note, to column 6, lines 33-44); determining a correlation between at least two of the second plurality of images (please note, to column 5, lines 20-23); and determining the period of the periodic motion based on the respective times associated with the at least two of the second plurality of images (please note, to column 6, lines 33-44).

It would have been obvious to a person of ordinary skill in the art at the time to use a second plurality of images of a second portion of the body as taught by O'Donnell in the system of Yavuz because O'Donnell provides Yavuz an improved system with capability of combining MR and CT information for an improved image having both shape and function information about organic structures and tissues.

Regarding claim 41, Yavuz is silent about the specific details regarding an apparatus according to claim 22, the processor further operative in conjunction with the stored process steps to:

acquire a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time substantially equal to a time associated with one of the plurality of images of the first portion of a body plus an integer multiple of the determined period.

In the same field (medical imaging) of endeavor, O'Donnell discloses model-based registration of cardiac CTA and MR acquisitions comprising:

acquire a second plurality of images of a second portion of the body, each of the second plurality of images associated with a respective time substantially equal to a time associated with one of the plurality of images of the first portion of a body plus an integer multiple of the determined period (please note, to column 6, lines 33-44).

It would have been obvious to a person of ordinary skill in the art at the time to use a second plurality of images of a second portion of the body as taught by O'Donnell in the system of Yavuz because O'Donnell provides Yavuz an improved system with capability of combining MR and CT information for an improved image having both shape and function information about organic structures and tissues.

Regarding claim 42, Yavuz is silent about the specific details regarding an apparatus according to claim 41, the processor further operative in conjunction with the stored process steps to:

generate a combined image based on the at least two of the plurality of images; generate a second combined image based on at least two of the second plurality of images, each of the at least two of the second plurality of images associated with a time substantially equal to a time associated with one of the at least two of the plurality of images of the first portion of a body plus an integer multiple of the determined period; and generate a third combined image based on the combined image and the second combined image.

In the same field (medical imaging) of endeavor, O'Donnell discloses model-based registration of cardiac CTA and MR acquisitions comprising:

generate a combined image based on the at least two of the plurality of images (please note, to column 4, lines 17-24); generate a second combined image based on at least two of the second plurality of images, each of the at least two of the second plurality of images associated with a time substantially equal to a time associated with one of the at least two of the plurality of images of the first portion of a body plus an integer multiple of the determined period (please note, to column 6, lines 33-44); and generate a third combined image based on the combined image and the second combined image (please note, to Fig. 7, and column 8, lines 35-51).

It would have been obvious to a person of ordinary skill in the art at the time to use combined images as taught by O'Donnell in the system of Yavuz because O'Donnell provides Yavuz an improved system with capability of combining MR and CT information for an improved image having both shape and function information about organic structures and tissues.

Other Prior Art

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Flohr et al (U S 6,381,487) disclose method and apparatus for producing CT images.

Rasche et al (U S 6,865,248B1) disclose method and device for acquiring a three-dimensional image data set of a moving organ of the body.

Yamagishi (U S 5,383,231) discloses method and apparatus for acquiring x-rat CT image in helical scanning mode, utilizing electrocardiogram.

Nambu et al (U S 5,412,562) disclose computerized tomographic imaging method and system for acquiring CT image data by helical dynamic scanning.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to ABOLFAZL TABATABAI whose telephone number is (571) 272-7458.

The Examiner can normally be reached on Monday through Friday from 9:30 a.m. to 7:30 p.m. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Bhavesh Mehta, can be reached at (571) 272-7453. The fax phone number for organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Abolfazl Tabatabai

Patent Examiner

Technology Division 2624

March 29, 2007

A-Tabatabai